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BUSINESS PRACTICE
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Project File

From:
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Date:
June 26, 2002

Subject:
Hydraulic Test - Boeing Torrance (Building 2 Area)

ARCADIS Project No.:
CA000594.0001

ARCADIS G&M (ARCADIS) has prepared this technical memorandum to outline the hydraulic test to be conducted at the Building 2 Area (former Boeing C-6 facility) located in Torrance, California. In general, the hydraulic test will be consistent with the approach for the Building 1/36 Area that was presented in the Building 1/36 IRZ Pilot Test Workplan. This work will be conducted before implementing the Building 2 In-Situ Reactive Zone Pilot Test Workplan that was approved by the California Regional Water Quality Control Board (CRWQCB) on May 17, 2002. Summarized below are the objectives, the proposed location, and the steps of the hydraulic test.

Objectives

The purpose of the hydraulic test is to collect data to determine the following:

1. The hydraulic conductivity (K value) in the upper saturated sandy-silt layer (screened approximately 13 and 23 feet below mean sea level [MSL]) and the deeper B-Sand zone (screened approximately 23 and 38 feet below MSL). The K value will be determined using the slug test data;
2. The radius of influence for the amendment points in each zone (determined by using potable water with a bromide tracer);
3. The effectiveness of using a ¾-inch diameter casing amendment point, installed using a cone penetrometer testing (CPT) rig. The effectiveness is defined as how easily the amendment point can be installed, how well the solution is distributed to the targeted zones, and the duration of delivery; and
4. Dilution effects of groundwater on the amendment solution.

Location and Layout of the Test

The hydraulic test will be conducted inside the source area of Building 2, within the 10,000 µg/L TCE isocontour. The location of the hydraulic test is illustrated on Figure 1. The hydraulic test will be conducted in two zones: the sandy-silt layer at approximately 13 to 23 feet below MSL and the B-Sand zone between 23 and 38 feet below MSL.

One hydraulic test point (HT-0001), two downgradient monitoring points (HT-0003 and MW-0001), and one crossgradient monitoring point (HT-0002) will be installed (Figure 2). Each location will be completed as dual-nested points for a total of 8 points. Monitoring points HT-0003 and MW-0001 will be located 5 and 15 feet downgradient of the hydraulic test point, respectively. The crossgradient monitoring point will be located 5 feet from the hydraulic test point. The hydraulic test points will be installed with 0.75-inch diameter casings using a CPT rig. The downgradient and crossgradient points located 5 feet from the hydraulic test point will be installed with 1.5-inch diameter casings using a hollow-stem auger (HSA) drill rig. The monitoring point located 15 feet downgradient of the hydraulic test point will be installed with 2-inch diameter casings using a HSA drill rig. Following well installation, monitoring points HT-0002, HT-0003, and MW-0001 will be developed for this hydraulic test. Additionally, monitoring point MW-0001 will be included as part of the pilot test monitoring program while HT-0001, HT-0002, and HT-0003 will be used as monitoring/amendment points if they are needed during future pilot testing.

Procedure

The hydraulic test will consist of five steps. The first step is groundwater sampling of the each of the dual-nested monitoring points and the hydraulic test points. A total of eight groundwater samples will be collected from these points and will be analyzed to obtain a baseline bromide concentration.

The second step will be a slug test to evaluate the hydraulic conductivity and transmissivity of each zone. The slug tests will be conducted on downgradient monitoring point MW-0001 in sandy silt layer (13 to 23 feet below MSL) and the B-Sand (23 to 38 feet below MSL).

In the third step potable water will be delivered at varying pressures to determine the optimum delivery pressure. The pressure will be increased from approximately 10 to 40 pounds per square inch (psi) in increments of approximately 10 psi in hydraulic test point HT-0001. The elapsed time to add 100 gallons will be recorded for each incremental pressure change. Pressure transducers will be installed in each monitoring point to evaluate changes in groundwater elevation during this step. This same procedure will be followed for each pressure step after groundwater levels have stabilized. The test will initially be conducted in the B-Sand (23 to 38 feet below MSL), then in the sandy silt layer (13 to 23 feet below MSL).

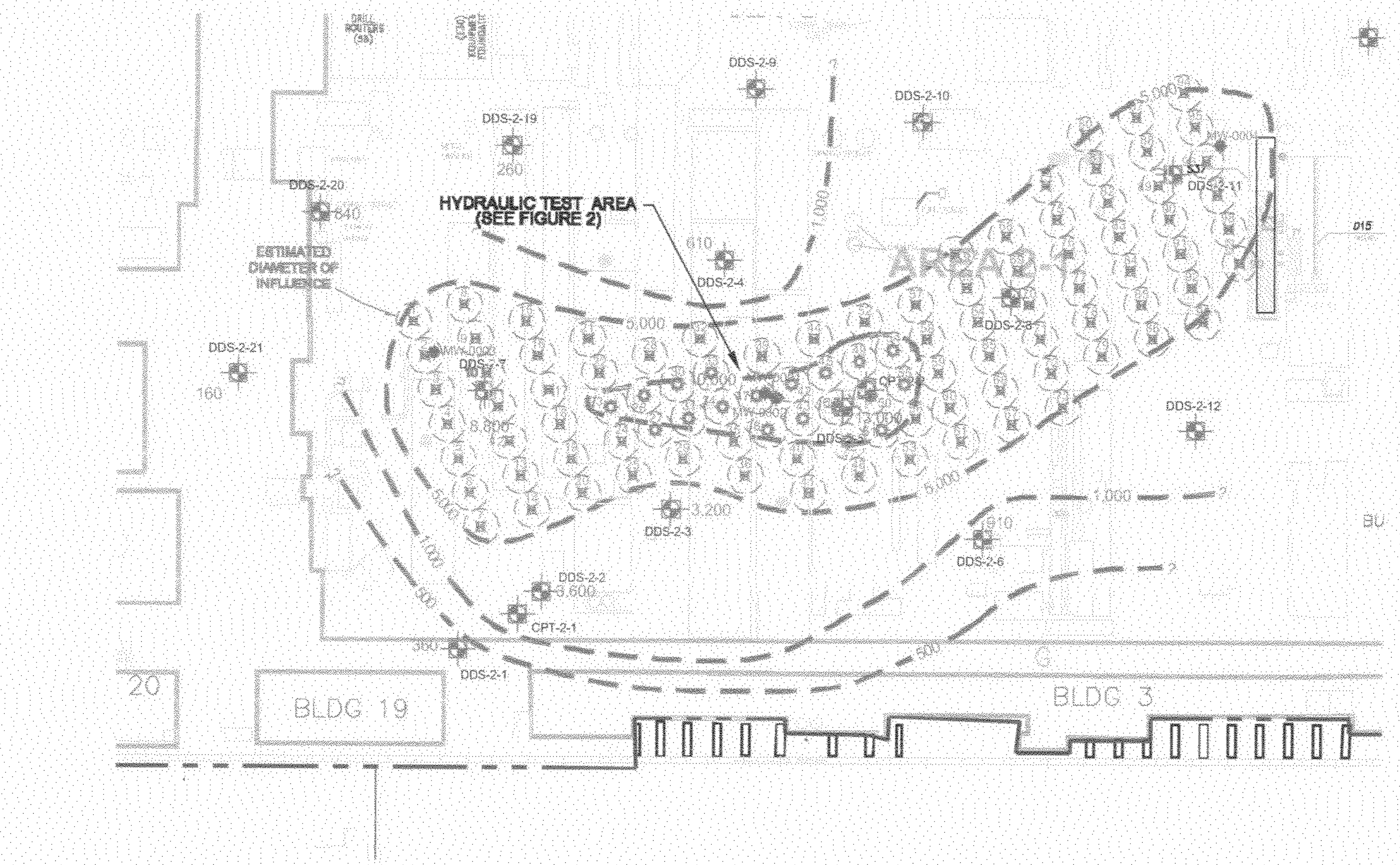
The fourth step will consist of adding approximately 400 gallons of potable water and bromide tracer to the hydraulic test point. The pressure that will be used will be based on data from the second step described above. Potassium bromide (KBr) powder will be used as the source of bromide. The tracer will be used to confirm groundwater flow rates and confirm estimated flow vectors and the lateral spread of the IRZ. The concentration of the bromide solution in the amendment solution will be approximately 100 to 300 mg/L; however, the concentration may be adjusted based on the baseline bromide concentration. It is anticipated that this amount of solution will achieve a reasonable and measurable concentration in groundwater downgradient of the amendment point. In conjunction with the amendment of water with bromide solution, groundwater samples will be collected from the downgradient and

crossgradient wells immediately upon the addition of the solution into hydraulic test point HT-0001. Following the collection of the initial samples, additional samples will then be collected at approximately 15-minute intervals (until all 400-gallons has been added) to determine if and when the bromide solution has traveled to the test points. A maximum of 12 samples per well in each zone will be collected. Approximately four select samples per well in each zone will be submitted to a laboratory for bromide analysis. Additionally, a pressure transducer will be installed in each monitoring well points to evaluate changes in groundwater elevation during this step. The B-Sand zone will be tested first and the sandy silt layer will be tested second. The same procedures will be conducted in each zone.

The final step will consist of groundwater sampling approximately one week after the completion of the fourth step. Groundwater samples will be collected from all eight points and analyzed for bromide. This step will evaluate the travel of the bromide solution under ambient groundwater flow.

Data Evaluation

The results of the hydraulic test will be evaluated to determine the amendment point spacing, the number of amendment points required, and the construction of the amendment points. Additionally, data collected during the test will be used to evaluate the potential amendment flow rate and the optimum amendment pressure. The results of the hydraulic test will be discussed with the CRWQCB and included in the final pilot test report, which is anticipated to be submitted in December 2004.



LEGEND

IRZ-MW2 PROPOSED MONITORING WELL LOCATION

23 PROPOSED IRZ AMENDMENT POINT (DESIGNATION AS IRZ-#)

27 PROPOSED DUAL IRZ AMENDMENT POINT

GROUNDWATER GRAB SAMPLE LOCATION

0 25 50 100
FEET

IRZ DESIGNED BY:
ARCADIS G&M

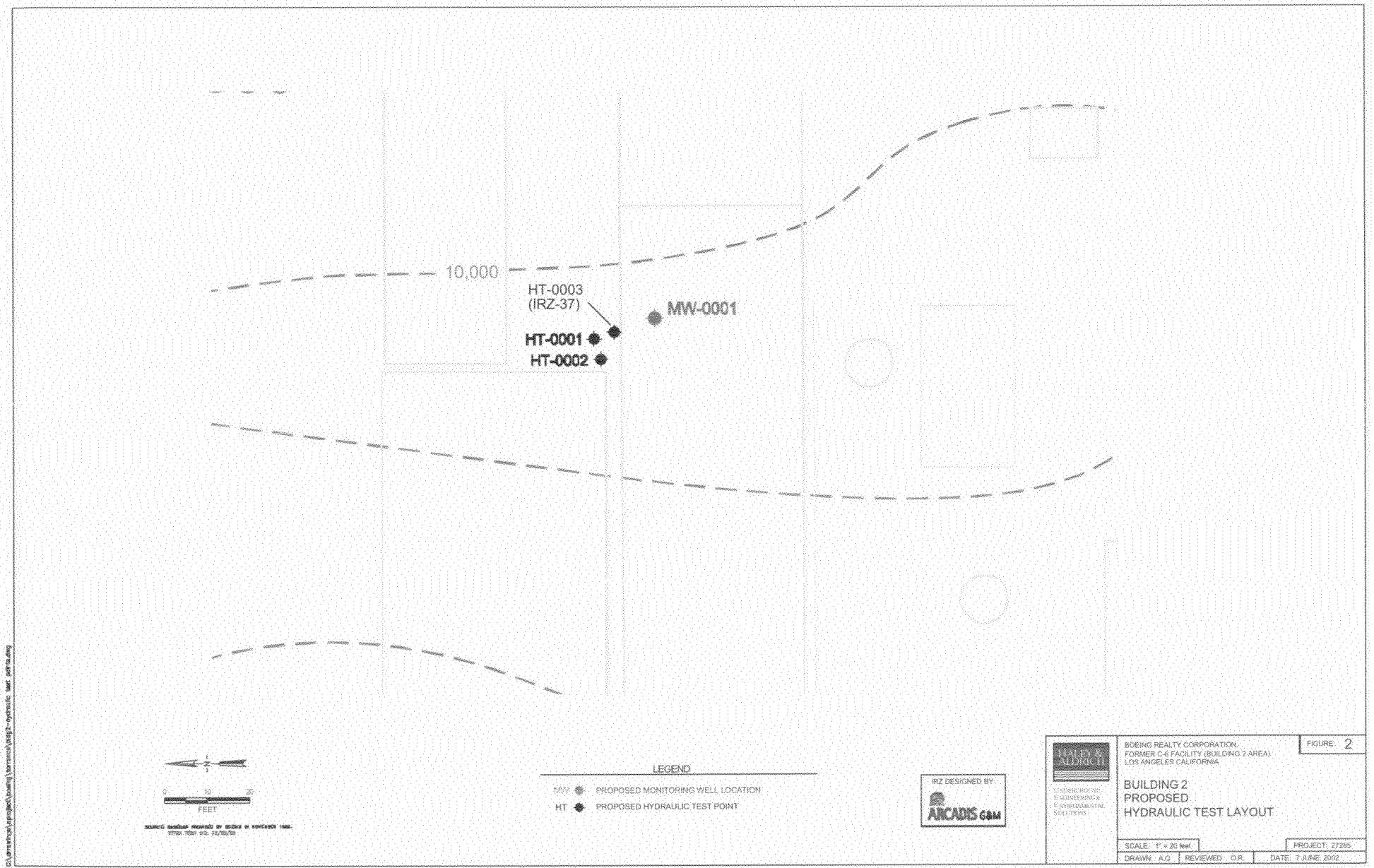
HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

BOEING REALTY CORPORATION
FORMER C-6 FACILITY (BUILDING 2 AREA)
LOS ANGELES CALIFORNIA

BUILDING 2
PROPOSED
HYDRAULIC TEST LOCATION

SCALE: 1" = 100 feet		PROJECT: 27285
DRAWN: A.Q.	REVIEWED: O.R.	DATE: 7 JUNE, 2002

FIGURE: 1



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